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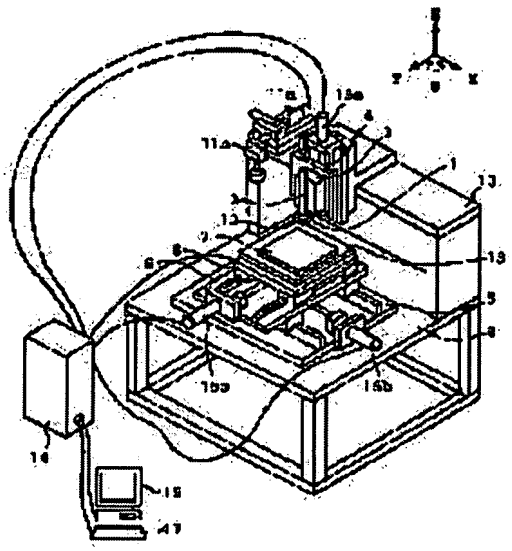
(54) PASTE APPLICATOR

(57)Abstract:

PURPOSE: To provide a paste applicator capable of easily confirming the cross section shape and cross section area of a pattern drawn on a substrate successively after the paste pattern is drawn and formed on the substrate, thereby efficiently controlling the quality and largely contributing to the improvement of productivity.

CONSTITUTION: This paste applicator is constituted so as to display the cross section shape and cross section area of the pattern on a monitor 16 by measuring the height of the surface of the substrate 7 by an optical range finder 3 after forming the paste pattern and calculating the coating height and width of the drawn pattern by using the measured data.



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* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] A substrate is laid on a table so that it may counter with the paste delivery of a nozzle. In the paste coating machine which the relative-position relation between this nozzle and this substrate is changed making the paste with which the paste receipt cylinder was filled up breathe out from the above-mentioned delivery to up to the above-mentioned substrate, and carries out drawing formation of the paste pattern of a request configuration on this substrate A measurement means to measure opposite spacing of the paste delivery of the above-mentioned nozzle, and the front face of the above-mentioned substrate, The migration means to which this measurement means and the above-mentioned substrate are relatively moved along the front face of this substrate, The paste coating machine characterized by having a cross-section prehension means to compute the spreading height and spreading width of face of a paste pattern using the measurement data of the above-mentioned measurement means at the time of this relative movement. [finishing / drawing]
[Claim 2] The paste coating machine characterized by having the correction means in which data correction is possible by removing a part for the inclination of the front face of the above-mentioned substrate which carried out the comparison operation of the measurement data at both [of measurement initiation and measurement termination of the above-mentioned cross-section prehension means] the times, and asked for them in the publication of claim 1.
[Claim 3] The paste coating machine characterized by being what asks for the spreading width of face of a paste pattern [finishing / drawing] from the distance between two measurement points which carry out a zero cross in the publication of claim 2 among the measurement data which the above-mentioned cross-section prehension means corrected with the above-mentioned correction means.
[Claim 4] The paste coating machine characterized by being what carries out the sequential comparison of the measurement data which the above-mentioned cross-section prehension means corrected with the above-mentioned correction means in the publication of claim 2, and finds the spreading height of a paste pattern [finishing / drawing].
[Claim 5] The paste coating machine characterized by having a profile display means by which the above-mentioned cross-section prehension means asks for the profile which arranged in time series the measurement data corrected with the above-mentioned correction means, and was approximated to the cross-section configuration of a paste pattern [finishing / drawing], and displays this profile on a monitor in the publication of claim 2.
[Claim 6] The paste coating machine with which the above-mentioned cross-section prehension means is characterized by having the spreading width of face of a paste pattern [finishing / drawing], spreading height and an abnormality judging means to judge whether either is in setting tolerance at least among the cross sections, and an exception-processing means to perform exception processing when judged with the outside of tolerance with this abnormality judging means in the publication of claims 1 or 2.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] Making a paste breathe out from a nozzle on the substrate laid on the table, by moving this substrate and this nozzle relatively, this invention relates to the paste coating machine which carries out spreading drawing of the paste pattern of a request configuration on this substrate, and relates to the suitable paste coating machine for the management of the cross-section configuration of a paste pattern, or the cross section which carried out drawing formation especially.
[0002]
[Description of the Prior Art] For the nozzle fixed at the tip of the paste receipt cylinder by which the paste was contained Making the substrate laid on the table counter and making a paste breathe out from the paste delivery of a nozzle by [of this nozzle and this substrate] moving either horizontally at least and changing relative-position relation An example of the paste coating machine using the regurgitation drawing technique which applies a paste by the desired pattern on a substrate is indicated by JP,2-52742,A.
[0003] This paste coating machine forms a desired resistive paste pattern on this insulating substrate by making resistive paste breathe out from the paste delivery at the tip of a nozzle on the insulating substrate used as a substrate.
[0004]
[Problem(s) to be Solved by the Invention] By the way, in the conventional paste coating machine mentioned above, it was not examined whether the cross-section configuration of the paste pattern which carried out drawing formation is a desired thing, and it was not made a problem especially about dispersion of the cross section, either. However, when dispersion in the cross section turns into dispersion in resistance as it is when drawing a resistive paste pattern, and drawing a sealing compound to the glass substrate of a liquid crystal display, dispersion in the cross-section configuration of this sealing compound has a possibility of inviting the lack of a seal, a display defect, etc.
[0005] So, the purpose of this invention is to offer the paste coating machine which the technical problem of this conventional technique can be canceled, and the cross-section configuration and the cross section of a paste pattern which carried out drawing formation on the substrate can check easily, and can perform efficient quality control.
[0006]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, this invention lays a substrate on a table so that it may counter with the paste delivery of a nozzle. In the paste coating machine which the relative-position relation between this nozzle and this substrate is changed making the paste with which the paste receipt cylinder was filled up breathe out from the above-mentioned delivery to up to the above-mentioned substrate, and carries out drawing formation of the paste pattern of a request configuration on this substrate A measurement means to measure opposite spacing of the paste delivery of the above-mentioned nozzle, and the front face of the above-mentioned substrate, It considered as the configuration equipped with a cross-section prehension means to compute the spreading height and spreading width of face of a paste pattern using the measurement data of the migration means to which this measurement means and the above-mentioned substrate are relatively moved along the front face of this substrate, and the above-mentioned measurement means at the time of this relative movement. [finishing / drawing]
[0007]
[Function] Although height amendment of a nozzle etc. can be performed from the measurement data at the time of paste pattern formation since it says that the above-mentioned measurement means measures opposite spacing on the paste delivery of a nozzle, and the front face of a substrate, it can ask for the spreading height and spreading width of face of a drawn pattern by calculating the measurement data of this measurement means after paste pattern formation. Therefore, if these spreading height and spreading width of face are compared with a setting allowed value, whether it

is what can permit the paste pattern which carried out drawing formation can judge easily. Moreover, if spreading height and spreading width of face are known, the cross-section configuration and the cross section of a drawn pattern will also be called for simply.

[0008]

[Example] Hereafter, the example of this invention is explained using a drawing.

[0009] Drawing 1 is the outline perspective view showing one example of the paste coating machine by this invention. 1 a paste receipt cylinder (or syringe) and 3 for a nozzle and 2 An optical range finder, In 4, a Z-axis table and 5 a Y-axis table and 7 for an X-axis table and 6 A substrate, In 8, theta shaft table and 9 a Z-axis table supporter and 11a for the stand section and 10 An image recognition camera, 11b -- for the adsorption base of a substrate 7, and 14, a control device, and 15a-15c of a servo motor and 16 are [the lens-barrel of this image recognition camera 11a, and 12 / nozzle support and 13 / a monitor and 17] keyboards.

[0010] In this drawing, the X-axis table 5 is fixed on the stand section 9, and the Y-axis table 6 is carried movable on this X-axis table 5 at X shaft orientations. And theta shaft table 8 is carried movable to Y shaft orientations, and rotatable on this Y-axis table 6, and the adsorption base 13 is being fixed on this theta shaft table 8. On this adsorption base 13, it adsorbs and a substrate 7 is fixed so that each of that side may become X, and Y each shaft and parallel, for example.

[0011] The substrate 7 carried on the adsorption base 13 can be moved to X and Y each shaft orientations by the control drive of a control unit 14. That is, if the Y-axis table 6 will move to X shaft orientations, a substrate 7 will move to X shaft orientations, if servo motor 15b drives with a control device 14, and servo motor 15c drives, theta shaft table 8 will move to Y shaft orientations, and a substrate 7 will move to Y shaft orientations. Therefore, when only the distance of arbitration moves the Y-axis table 6 and theta shaft table 8 with a control device 14, respectively, only the distance of arbitration will move a substrate 7 in the direction of arbitration in a field parallel to the stand section 9. In addition, only an arbitrary dose can rotate theta shaft table 8 in the direction of theta centering on the center position by servo motor 15d shown by drawing 4 .

[0012] Moreover, the Z-axis table supporter 10 is installed on the stand section 9, and the Z-axis table 4 is attached in Z shaft orientations (the vertical direction) movable at this. And the nozzle 1, the paste receipt cylinder 2, and the optical range finder 3 are laid in this Z-axis table 4. The control drive of Z shaft orientations of the Z-axis table 4 is also performed by the control unit 14. That is, if servo motor 15a drives with a control device 14, the Z-axis table 4 will move to Z shaft orientations, and a nozzle 1, the paste receipt cylinder 2, and the optical range finder 3 will move to Z shaft orientations in connection with this. In addition, although the nozzle 1 is formed at the tip of the paste receipt cylinder 2, it is slightly separated from the nozzle 1 and the lower limit of the paste receipt cylinder 2 through the nozzle support 12 equipped with the connection section.

[0013] The optical range finder 3 measures the distance between the paste delivery which is the tip (lower limit) of a nozzle 1, and the top face of a substrate 7 by the non-contact Misumi ** method.

[0014] That is, as shown in drawing 2 , the lower limit section of the optical range finder 3 is deeply cut by 3 corniform, a light emitting device is prepared in one side of two slant faces which counter this infeed part, and the photo detector is prepared in another side, respectively. The nozzle support 12 is attached at the tip of the paste receipt cylinder 2, it is extending to the lower part of the above-mentioned infeed section of the optical range finder 3, and the nozzle 1 is attached in the inferior surface of tongue of the point. The light emitting device prepared in the above-mentioned infeed section of the optical range finder 3 irradiates near just under a paste delivery, as an alternate long and short dash line shows, and the above-mentioned photo detector receives the reflected light from there. And when the distance between the substrates 7 (refer to drawing 1) arranged down the paste delivery of a nozzle 1 and this delivery is predetermined within the limits, so that the light from a light emitting device may be received by the photo detector If the physical relationship of a nozzle 1 and the optical range finder 3 is set up and the distance between the paste delivery of a nozzle 1 and a substrate 7 changes, it will set near just under this delivery. Since the location of the irradiating point (this is hereafter called measure point) on the substrate 7 of the light from a light emitting device changes and the light-receiving condition in a photo detector therefore changes, the distance between the paste delivery of a nozzle 1 and a substrate 7 is measurable.

[0015] If the irradiating point (this is hereafter called measure point) on the substrate 7 of the light from a light emitting device crosses the already formed paste pattern when a substrate 7 moves to X and Y shaft orientations and forms the paste pattern so that it may mention later , the error only for thickness of a paste pattern will arise at the measurement value of the distance between the paste deliveries of a nozzle 1 and the front faces of a substrate 7 by the optical range finder 3 . Then, in order to make it a measure point not cross a paste pattern as much as possible, it is

good to make into a measure point the location which shifted from the point (this is hereafter called applying point) from a nozzle 1 to a substrate 7 top dropped [paste] in the direction of slant to X and a Y-axis.
[0016] Drawing 3 is the explanatory view which expressed the relation between the measurement range MR of the optical range finder 3, and the attaching position of a nozzle 1 in the vertical plane. As shown in this drawing, the paste delivery at the tip of a nozzle 1 is arranged between the core C of the measurement range MR of the optical range finder 3, and the upper limit U. Rather than this delivery, in a lower part, if the substrate 7 with which the paste pattern PP is drawn is placed more nearly up than the minimum L of the measurement range MR, it can measure the height location of the front face of this substrate [/ near just under a nozzle 1] 7 to non-contact with the optical range finder 3 on the basis of this nozzle 1.
[0017] In addition, although a nozzle 1 will be attached so that it may be in agreement with a certain setting location where nozzle replacement is performed and an applying point tends to apply the paste on a substrate 7 if the paste in the paste receipt cylinder 2 is used up, the location of a nozzle 1 may change in front of nozzle replacement and in the back by dispersion in the paste receipt cylinder 2, the nozzle support 12, and the anchoring precision of a nozzle 1 etc. However, as shown in drawing 2 , when an applying point is in the tolerance (delta X, delta Y) of the magnitude beforehand set up centering on the setting location, the nozzle 1 shall be attached normally. However, deltaX is the width of face of X shaft orientations of tolerance, and, similarly deltaY is the width of face of Y shaft orientations.
[0018] A control device 14 will drive servo motor 15d servo motors 15a, 15b, and 15c and for ** theta shaft table rotation (refer to drawing 4) according to this, if data are supplied from the optical range finder 3 or image recognition camera 11a. Moreover, the data about the drive situation of each motor are fed back to a control device 14 from the encoder formed in these servo motors.
[0019] In this configuration, if the substrate 7 which makes the shape of a rectangle is placed on the adsorption base 13, the adsorption base 13 will carry out vacuum adsorption of the substrate 7, and will carry out fixed maintenance. And by rotating theta shaft table 8, it is set up so that each side of a substrate 7 may become parallel to X and each Y-axis. By carrying out drive control of the servo motor 15a based on the measurement result of the optical range finder 3 after an appropriate time, the Z-axis table 4 moves caudad, and this nozzle 1 is dropped from the upper part of a substrate 7 until the distance between the paste delivery of a nozzle 1 and the front face of a substrate 7 turns into a regular distance.
[0020] Then, the paste supplied through the nozzle support 12 from the paste receipt cylinder 2 is breathed out on a substrate 7 from the paste delivery of a nozzle 1, with this, the Y table 6 and theta shaft table 8 move suitably by drive control of servo motors 15b and 15c, and a paste is applied by this by the pattern of a request configuration on a substrate 7. Since the paste pattern which it is going to form is convertible in X and the distance of Y each shaft orientations, if the data for forming the pattern of a request configuration are inputted from a keyboard 17, a control device 14 will change these data into the pulse number given to servo motors 15b and 15c, an instruction will be outputted, and drawing will be performed automatically.
[0021] Drawing 4 is the block diagram showing one example of the control device 14 in drawing 1 . 14a a motor controller and 14ca for a microcomputer and 14b A Z-axis driver, 14cb(s) a Y-axis driver and 14 cds an X-axis driver and 14 cc theta shaft driver, The converter and E to which, as for an external interface, the servo motor for [15d] theta shaft table rotation, and 18, an image processing system and 14e carry out A-D conversion of the 14d (distance) of the measurement results of the optical range finder 3 are an encoder, and the same sign is given to drawing 1 and a corresponding part.
[0022] Microcomputer 14a to which the control device 14 contained CPU which performs the operation of RAM which memorizes ROM which stores the processing program, and various data, or various data in explaining to a detail, A servo motors [each / 15a-15d] motor controller 14b and each servo motors [15a-15d] driver 14ca-14cd, It has external-interface 14e by which this 14d of image processing systems and keyboard 17, and A-D-converter 18 grade are connected with 14d of image processing systems which process the image read by image recognition camera 11a. The data in which a paste drawing pattern, nozzle replacement, etc. from a keyboard 17 are shown, the data measured with the optical range finder 3, the various data generated by processing of microcomputer 14a are stored in RAM built in microcomputer 14a.
[0023] Next, processing actuation of the control unit 14 for the configuration judging of a paste pattern which carried out spreading drawing with paste coating actuation is explained. In addition, in the flow chart after drawing 5 , the sign S in drawing means the step.
[0024] In drawing 5 , an injection of a power source performs initial setting of a paste coating machine (step 200). (step 100) It says that this initial setting is positioned to the home position which was able to determine beforehand the Y-

axis table 6, theta shaft table 8, and the Z-axis table 4 grade (step 201), sets up the data of a paste pattern, and the location data of a substrate 7 (step 202), and sets up regurgitation termination location data and shape-measurement data of a paste as shown in drawing 6 (step 203), and the data input for a setup is performed from a keyboard 17. In addition, a setup of shape-measurement data performed at step 203 is setting up the starting position of the number of measurement parts, and each measurement part, a termination location, the number of measure points in each measurement part (the number of samplings), etc. Moreover, the data inputted from the keyboard 17 in this way are stored in RAM of built-in in microcomputer 14a as mentioned above.

[0025] After the above initialization process finishes, in drawing 5 , the substrate 7 for drawing a paste pattern is carried in the adsorption base 13, adsorption maintenance is carried out (step 300) and substrate preliminary positioning processing is performed (step 400).

[0026] Hereafter, drawing 7 explains this step 400 to a detail.

[0027] In drawing 7 , the mark for positioning (plurality) first given to the substrate 7 carried in the adsorption base 13 beforehand is photoed by image recognition camera 11a (step 401), and it asks for the center-of-gravity location of the mark for positioning within the visual field of image recognition camera 11a by the image processing (step 402). And the amount of gaps of the core of this visual field and the center-of-gravity location of the mark for positioning is computed (step 403), and the movement magnitude of Y-axis theta shaft table 6 and 8 required in order to move a substrate 7 to a request location is computed using this amount of gaps (step 404). And by converting these computed movement magnitude into a servo motors [15b-15d] control input (step 405), and driving servo motors 15b-15d according to this control input, each tables 6 and 8 move and a substrate 7 moves to the direction of a request location (step 406).

[0028] With this migration, the mark for positioning on a substrate 7 is again photoed by image recognition camera 11a, the core (center-of-gravity location) of the mark for positioning within that visual field is measured (step 407), it asks for the deflection of the core of a visual field, and the core of a mark, and this is stored in RAM of microcomputer 14a as an amount of location gaps of a substrate 7 (step 408). And it checks whether the amount of location gaps is within the limits of the tolerance explained by drawing 2 , for example, 1/2 or less value, (step 409). If it is within the limits of this, it will mean that processing of step 400 was completed. If it is outside this range, it returns to step 404 and a series of above processings are performed again, and it will repeat until the amount of location gaps of a substrate 7 enters within the limits of the above-mentioned value.

[0029] It means that this substrate 7 was positioned so that the applying point which is going to start spreading might not separate across the predetermined range by this from just under the paste delivery of a nozzle 1 from this on a substrate 7.

[0030] Again, in drawing 5 , after processing of step 400 is completed next, it moves to the paste film formation process (processing) of step 500. Drawing 8 explains this hereafter.

[0031] In drawing 8 , a substrate 7 is first moved to a spreading starting position (step 501), and, subsequently the height of a nozzle 1 is set up (step 502). That is, it sets up so that spacing from the delivery of a nozzle 1 to the front face of a substrate 7 may become equal to the thickness of the paste film to form. Since the substrate 7 is positioned in the request location by substrate preliminary positioning processing (step 400 of drawing 5) in which it explained previously, at the above-mentioned step 501, a substrate 7 can be moved with a sufficient precision to a spreading starting position, it moves to step 503, and a nozzle 1 starts the regurgitation of a paste from this spreading starting position.

[0032] And by inputting the observation data of opposite spacing of the paste delivery of a nozzle 1 and substrate 7 by the optical range finder 3, the wave of the front face of this substrate 7 is measured (step 504), and the judgment of whether the measure point which the optical range finder 3 mentioned above is crossing the paste film top with this observation data is performed (step 505). For example, when it separates from the allowed value of opposite spacing which the observation data of the optical range finder 3 set up, it is judged with a measure point being on the paste film.

[0033] When there is no measure point of the optical range finder 3 on the paste film, the amendment data for moving the Z-axis table 4 based on observation data are computed (step 506). And the height of a nozzle 1 is amended using the Z-axis table 4, and the location of the nozzle 1 in Z shaft orientations is maintained to the set point (step 507). On the other hand, when a measure point is judged to be under passage of on the paste film, height amendment of a nozzle 1 is not performed but it holds in the height before this judgment. In addition, since there is almost no change in the wave of a substrate 7 while a measure point is passing through the paste film top of slight width of face, even if it does not perform height amendment of a nozzle 1, it is changeless in the regurgitation configuration of a paste, and the paste

pattern of desired thickness can be drawn.

[0034] Next, it judges whether the set-up pattern actuation was completed (step 508). If it is completion, the paste regurgitation is ended (step 509), and it will return to substrate surface waviness measurement processing (step 504), continuing the paste regurgitation, if it has not completed. Therefore, if a measure point finishes passing through a paste film top, the height amendment process of the nozzle 1 mentioned above will be resumed. In addition, step 508 is processing actuation which judges whether the ending point of the paste pattern which had drawn continuously till then was reached, and this ending point is not necessarily an ending point of the pattern of the whole request configuration which is going to draw to a substrate 7. That is, the judgment of whether to have reached the ending point of all the patterns that the pattern of the whole request configuration may consist of two or more partial patterns divided mutually, and contain them all is performed at step 511. In addition, before moving to step 511, the Z-axis table 4 is driven at step 510, and a nozzle 1 is raised to an evacuation location. Although it finished forming a partial pattern at step 511, when it is judged with having not completed drawing of all patterns, a substrate 7 is again moved to a spreading starting position (step 501), and a series of above processes are repeated.

[0035] Thus, if formation of the paste film is performed over the whole pattern of a request configuration, a paste film formation process (step 500) will be ended.

[0036] Again, after processing of step 500 is completed in drawing 5 , when measuring [whether the cross-section configuration of the paste film which progressed to step 550 and carried out drawing formation is measured, and] by judging, it progresses to a cross-section shape-measurement process (step 600), and when not carrying out, it progresses to a substrate discharge process (step 800).

[0037] Hereafter, the cross-section shape-measurement process (step 600) of the paste film is explained, referring to drawing 9 .

[0038] First, the substrate 7 with which the paste pattern was drawn is moved to a measurement starting position (step 601), and the height of the optical range finder 3 is set up (step 602). And from this measurement starting position, the height on the front face of a substrate (paste pattern front face) is measured with the optical range finder 3 (step 603), and a measurement result is stored in RAM of microcomputer 14a (step 604). Then, the next measure point is made to carry out pitch migration of the substrate 7 (step 605). If the distance of this pitch migration makes [many] the numeric value of n based on the setting data which do n division into equal parts of the shape-measurement section, the number of measure points (the number of samplings) will increase. Next, it judges whether the height measurement in the shape-measurement section was completed (step 606), and when it is not termination, in return and a new measure point, the height on the front face of a substrate is measured to step 603. Therefore, if between step 603 to the step 606 is gone back and forth once [n+], measurement in this shape-measurement section will be ended. In addition, the measurement data based on the optical range finder 3 are a discrete value for every pitch, since it is not a continuation value, if the numeric value of n is made [many], the number of measure points will increase, and the judgment result of the cross-section configuration of the drawn pattern within the measurement section becomes exact.

[0039] If measurement in the shape-measurement section is completed, the optical range finder 3 is raised (step 607), when judging at step 608 whether measurement was completed or not and having not completed about all the measurement parts set up beforehand, it will return to step 601 which moves a substrate 7 to a measurement starting position, and a series of processings to the above-mentioned step 607 will be repeated. And if it is measurement termination in all measurement parts, it will end and will move from this cross-section shape-measurement process (step 600) to the cross-section configuration judging process (step 700) of drawing 5 .

[0040] Hereafter, this cross-section configuration judging process (step 700) is explained, referring to drawing 10 .

[0041] Inclination amendment of a measurement result is performed at introduction and step 701. Namely, although the height location on the front face of a substrate should maintain zero level in the paste film absent field as the stand section 9 of drawing 1 should be installed so that the adsorption base 13 may originally become level, and (a) of drawing 11 shows the measurement result of the optical range finder 3 which measured the height on the front face of a substrate In fact, with the inclination of the stand section 9 etc., as shown in drawing 11 (b) and (c), an upward slant to the right or the lower right may serve as [a measurement result] **. Then, correction processing is performed at step 701 that it should ask for the inclination on the front face of a substrate required for amendment of a measurement result from the difference of the measurement data Ds of the measurement starting position in the shape-measurement section MA, and the measurement data De of a measurement termination location, and the error of the measurement data resulting from this inclination should be eliminated. In addition, although the continuation value shows measurement data for convenience in drawing 11 , measurement data are a discrete value as mentioned above.

[0042] Next, the zero cross locations P1 and P2 are obtained from the measurement data which amended the

inclination, and it asks for spacing of these zero cross locations P1 and P2, and let the spacing be the spreading width of face of a paste pattern (step 702). Then, the sequential comparison of the measurement data (each discrete value) which amended the inclination is carried out between the measurement data De of a measurement termination location from the measurement data Ds of a measurement starting position, and maximum is calculated and let the value be the spreading height Dh of a paste pattern (step 703).

[0043] Next, it progresses to step 704 and judges whether it is less than a reference value as compared with the reference-value data which had set up beforehand the spreading width of face (P2-P1) and the spreading height Dh of the paste pattern for which it asked by processing of steps 702 and 703. When having separated from the reference value, it progresses to step 705 and exception processing of displaying the contents of abnormalities on the monitor 16 of drawing 1 is performed. And it judges whether when the case within a reference value and exception processing were completed, it progressed to step 706 and cross-section configuration judging processing of all measurement parts was completed, when a series of processings which returned and mentioned above to step 701 when it was not completion are repeated and performed and it completes, the configuration judging result of all measurement parts displays (step 707), and a cross-section configuration judging process (step 700) ends.

[0044] Again, after step 700 mentioned above in drawing 5 is completed, it moves to step 800, substrate discharge processing is performed, and a substrate 7 is removed from the adsorption base 13. It judges whether all the above processes are stopped after an appropriate time (step 900), in carrying out spreading drawing of the paste by the same pattern as another substrate, it returns to step 300, and a series of processings of steps 300-900 are repeated to this substrate.

[0045] thus, in the above-mentioned example, the cross-section configuration of this paste film that carried out drawing formation after paste film formation using the optical range finder 3 which measures data required for height amendment of a nozzle 1 with the paste film formation process (step 500) can be judged -- since it is like (steps 600 and 700), efficient quality control can be performed.

[0046] For example, if it is the paste pattern PP of the boiled-fish-paste form equipped with desired width of face and desired height as the sealing compound which carried out drawing formation shows to drawing 12 (a) when manufacturing a liquid crystal display, when sticking glass substrates, sufficient seal effectiveness can expect, but as shown in drawing 12 (b), and (c), unless the spreading width of face of the paste pattern PP or spreading height is a desired value, sufficient seal effectiveness is not expectable. That is, if spreading width of face becomes small for un-wanting as shown in drawing 12 (b), a pattern piece is caused and it becomes easy to generate a poor seal, and when the paste pattern PP is resistive paste, it will become the cause of a raise in resistance, or an open circuit. Moreover, if a depression is made in the center section and it is insufficient of spreading height as shown in drawing 12 (c), when sticking two glass substrates, this depression part will be shut up among both glass substrates, and will become a void, and the seal effectiveness will be reduced. Furthermore, although illustration has not been carried out, if the width of face and the height of a paste pattern are larger than a request value, with resistive paste, the reduction in resistance and a short circuit are invited, when sticking two glass substrates, in the case of the sealing compound of a liquid crystal display, an excessive sealing compound will overflow horizontally, and it will tend to invite the display defect of this sealing compound covering TFT prepared on the glass substrate.

[0047] Therefore, if the cross-section configuration is displayed on a monitor 16 and it enables it to check it, when the spreading width of face and the spreading height of a drawn pattern have separated from the allowed value, since it can presume the result condition of the product manufactured, and classification ****** can do an excellent article and a defective while be a manufacture process, efficient quality control can be performed and it can contribute to a productivity drive greatly. And since it can move to the cross-section configuration judging process of a drawn pattern as it is, without not removing the substrate which carried out spreading drawing of the paste pattern from equipment, or performing the parts replacement of this equipment, the complicated dead work for a judgment is unnecessary, and a fear of making a production line complicate does not have it, either.

[0048] In addition, when the spreading height of a paste pattern is set to 0, a pattern piece is meant, but since the paste in the paste receipt cylinder 2 may have been consumed as a cause of a pattern piece, if unusual spreading height is displayed on a monitor 16 and checked, the paste residue check in the paste receipt cylinder 2 can also be performed.

[0049] Finally, data processing of microcomputer 14a (refer to drawing 4) performed for the cross-section configuration display of a drawn pattern is explained, referring to drawing 13 .

[0050] In drawing 13 , MPx shown by the sunspot is measurement data of the spreading height of the drawn pattern with which the measure point in each pitch carried out and Hx were obtained in each measure point MPx n division into equal parts about the shape-measurement section, and each measurement data Hx is stored in RAM of

microcomputer 14a. So, the profile of the cross-section configuration of a drawn pattern can be displayed by displaying each measurement data Hx on the monitor 16 one by one (to time series).

[0051] Moreover, in displaying the cross section in addition to the display of a cross-section configuration, it performs the following processings. Namely, if spacing of each pitch which did n division into equal parts of the shape-measurement section is set to Wx, since recently which considers that the spreading height of a drawn pattern is an EQC within the limits of each pitch spacing Wx can be performed About all of the shape-measurement sections, the product of the each measurement data Hx and the pitch spacing Wx which are stored in RAM of microcomputer 14a is added together, and it is sigma (if the value of WxxHx] is calculated). The cross section approximated to the area of the actual cross-section configuration of the drawn pattern shown in drawing 13 with a broken line is obtained, and order of approximation can be raised by setting up several n division into equal parts greatly.

[0052] In this way, it is [be / it / if / it enables it to grasp the cross section of a drawn pattern,] effective when drawing especially the paste for resistance, and checking whether it is desired resistance. That is, it sets at the cross-section configuration judging process (step 700) mentioned above, and you may make it the cross section judge whether it is the inside of a reference value in the paste for resistance, since desired resistance will be acquired if the cross section is in an allowed value even if the width of face and the height of a pattern have separated from the request value instead of spreading width of face or spreading height for whether it is the inside of a reference value.

[0053] In addition, in order to attain shortening of the duration in a spreading machine initialization process (step 200), The storage read-out equipment with which external-interface 14e (refer to drawing 4) is loaded with enternal memory means, such as an IC card or a floppy disk, and a hard disk, is connected. On the other hand, a data setup required for a spreading machine initialization process is beforehand performed with the personal computer etc. You may make it move various data from an enternal memory means to RAM of microcomputer 14a through the storage read-out equipment linked to external-interface 14e at the time of a spreading machine initialization process. Moreover, the measured data are stored in enternal memory means, such as an IC card or a floppy disk, and a hard disk, and the data about a judgment result are stored in an enternal memory means, and you may enable it to be able to attain memory-capacity expansion-ization of RAM of microcomputer 14a, or to use them later.

[0054]

[Effect of the Invention] As explained above, the paste coating machine by this invention By computing the spreading height and spreading width of face of a paste pattern which carried out drawing formation on this substrate using the data of a measurement means to measure opposite spacing on the paste delivery of a nozzle, and the front face of a substrate Since whether the drawn pattern has a desired cross-section configuration and the desired cross section can judge easily, efficient quality control can be performed, and moreover, since the complicated dead work for a judgment is unnecessary, it is size very much the place which contributes to a productivity drive.

[Translation done.]